



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,033	03/31/2004	Christophe J. Dorrer	9-10-7-9	7803
46363	7590	02/05/2008	EXAMINER	
PATTERSON & SHERIDAN, LLP/ LUCENT TECHNOLOGIES, INC 595 SHREWSBURY AVENUE SHREWSBURY, NJ 07702			LE, THI Q	
		ART UNIT	PAPER NUMBER	
		2613		
			MAIL DATE	DELIVERY MODE
			02/05/2008	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	10/815,033	DORRER ET AL.
	Examiner	Art Unit
	Thi Q. Le	2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 03 November 2007.
- 2a) This action is **FINAL**.                                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 2-10, 12-14, 19-23, 25, 26, 28 and 29 is/are pending in the application.
  - 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 2-10, 12-14, 19-23, 25-26, 28-29 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 31 March 2004 is/are: a) accepted or b) objected to by the Examiner.
 

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All    b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) Notice of Informal Patent Application
- 6) Other: \_\_\_\_\_

**DETAILED ACTION**

***Priority***

1. Applicant's claim for domestic priority under 35 U.S.C. 119(e) is acknowledged.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. **Claims 10, 2-3, 29** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ito** (US Patent # 6,650,846) in view of **Miyamoto et al. (US Patent # 7,116,917)**.

Consider **claim 10**, Ito clearly shows and discloses, a method comprising: precoding an electronic data signal (an intensity modulator 2, modulating optical signal with NZR data; figure 13); modulating the output of an optical source using the precoded electronic data signal and differential phase shift keying to generate an encoded optical signal (phase modulator 3, modulating the optical signal using phase modulation scheme; figure 13); and alternating the polarization of the encoded optical signal using a modulator such that successive optical bits have substantially orthogonal polarizations to generate an APol-DPSK signal (the polarization modulator 4, modulates the output from unit 3; such that, adjacent bits are mutually orthogonal in term of polarization; figure 13) (figure 13; column 10 lines 19-35). The Examiner takes Official Notice that it is well known in the art to use phase shift keying and differential phase shifting keying as modulation scheme for long distance transmission, since they offer efficient bandwidth usage; thus allowing more data to be transmitted. It would have been obvious for a person of ordinary skill in the art to understand that the phase modulator 3, figure 13, disclosed in Ito can be arranged to perform PSK or DPSK modulation.

Ito fails to discloses, differential phase shift keying between two optical bits separated by an even number of bit periods; and demodulating the APol-DPSK signal using an even bit delay line interferometer.

In related art, Miyamoto discloses, an optical transmitting system. The system is configure to perform, differential phase shift keying between two optical bits separated by an even number of bit periods to generate an encoded optical signal (figure 17 shows phase

modulator 3 generating DPSK optical signal using the encoded signal, from precoding unit 2, with 2 bit separation; column 11 lines 16-18, column 16 lines 39-50); and demodulating the APol-DPSK signal using an even bit delay line interferometer (Figure 17 shows a 2 bit delay optical filter 5 is placed at the transmitter end, while Figure 21 shows placing an optical filter 60 at the receiver end; thus it would have been obvious that the 2 bit delay optical filter 5 shown in figure 17 can also be placed at the receiver end; column 16 lines 40-50, column 17 lines 40-55).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

Consider **claims 2 and 3, and as applied to claim 10 above**, Ito modified Miyamoto disclosed a phase modulator, but fails to disclose a phase modulator is driven by a sinusoidal RF voltage or square pulses.

The examiner take official notice that it is well known in the art at the time of the invention that either sinusoidal RF voltage or square pulse can be use to drive a typical phase modulator. Since, different applications have different requirements, thus, using sinusoidal RF voltage or square pulses to drive a phase modulator provides different fills the different requirements of a particular application.

Consider **claim 29**, Ito discloses, an optical transmission system for APol-DPSK transmission comprising: an optical source (light source 1; figure 13); a precoder device for precoding an electronic data signal (intensity modulator 2 and phase modulator 3; figure 13); an optical phase-shift-keying data modulator optically coupled to the laser source and driven by a

precoded electronic data signal from the precoder device to produce an optical DPSK signal wherein electronic data to be transmitted is optically encoded by the data modulator (figure 13 shows, intensity modulator 2 and phase modulator 3, for modulating the optical signal using phase modulation scheme; figure 13); and a polarization alternator (polarization modulator 4; figure 13) optically coupled to the data modulator to provide polarization alternation of the output of the data modulator (figure 13; column 10 lines 19-35). The Examiner takes Official Notice that it is well known in the art, for a phase modulator to be arranged to perform phase shift keying or differential phase shifting keying, for the same reason as indicated in claim 10.

Ito fails to discloses, differential phase shift keying between two optical bits separated by an even number of bit periods; and demodulating the APol-DPSK signal using an even bit delay line interferometer.

In related art, Miyamoto discloses, an optical transmitting system. The system is configured to perform, differential phase shift keying between two optical bits separated by an even number of bit periods to generate an encoded optical signal (figure 17 shows phase modulator 3 generating DPSK optical signal using the encoded signal, from precoding unit 2, with 2 bit separation; column 11 lines 16-18, column 16 lines 39-50); and demodulating the APol-DPSK signal using an even bit delay line interferometer (Figure 17 shows a 2 bit delay optical filter 5 is placed at the transmitter end, while Figure 21 shows placing an optical filter 60 at the receiver end; thus it would have been obvious that the 2 bit delay optical filter 5 shown in figure 17 can also be placed at the receiver end; column 16 lines 40-50, column 17 lines 40-55).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of

Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

6. **Claims 9, 5-8, 12-14, 25, 19-20, 26, 28** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ito (US Patent # 6,650,846)** in view of **Miyamoto et al. (US Patent # 7,116,917)** and further in view of **Van Der Tol (US Patent # 5,708,734)**.

Consider **claim 9**, Ito discloses, a method of APol-PSK transmission comprising: using an electronic data signal to drive a modulator to provide simultaneous polarization alternation and optical data encoding by phase shift keying to generate an APol-PSK signal (figure 13 shows, combination intensity modulator 2, phase modulator 3 and polarization modulator 4, modulate the optical signal; such that, adjacent bits are mutually orthogonal in term of polarization; column 10 lines 10-45). The Examiner takes Official Notice that it is well known in the art to use phase shift keying and differential phase shifting keying as modulation scheme for long distance transmission, since they offer efficient bandwidth usage; thus allowing more data to be transmitted. It would have been obvious for a person of ordinary skill in the art to understand that the phase modulator 3, figure 13, disclosed in Ito can be arranged to perform PSK or DPSK modulation.

Ito fails to disclose, wherein the modulator is a Mach-Zehnder modulator having a polarization rotation device in at least one arm; and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same.

In related art, Miyamoto discloses, an optical transmitting system. The system includes a MZM phase modulator 3; wherein the phase modulator 3 is configured to encode incoming data using phase shift; figures 13 and 14, column 14 line 55 - column 15 line 45).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22 (the two couplers are polarization independent couplers, meaning they do not separate the optical signal according to their polarization), two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) (Since phase shifters and polarization converters are within the arms of the interferometer; simultaneous polarization alternation and phase shift modulation can be accomplished).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claim 5, and as applied to claim 10 above**, Ito modified by Miyamoto disclose the invention as described above; except for, wherein the modulator is a Mach-Zehnder modulator including a polarization rotation device in at least one arm.

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm (figure 3 shows an interferometer comprising two 50/50

coupler 21 and 22, two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claim 6**, and as applied to **claim 5 above**, Ito modified by Miyamoto and Van Der Tol disclose the invention as described above, except for, wherein the polarization rotation device is a half-wave plate. The Examiner takes official notice that it is well known in the art that a half-wave plate is use for polarization rotation of 90 degrees. Since Van Der Tol discloses a polarization converter for converting TE to TM polarization and vice versa. Then it would have been obvious for a person of ordinary skill in the art to know that the polarization converter can be a half-wave plate. Since using a half-wave plate for polarization rotation is simple and requires little components; thus, reducing the cost of the system.

Consider **claims 7 and 8, and as applied to claim 5 above**, Ito modified by Miyamoto and Van Der Tol disclosed a phase modulator, but fails to disclose a phase modulator is driven by a sinusoidal RF voltage or square pulses.

The examiner take office notice that it is well known in the art at the time of the invention that either sinusoidal RF voltage or square pulse can be use to drive a typical phase modulator. Since, different applications have different requirements, thus, using sinusoidal RF voltage or square pulses to drive a phase modulator provides different fills the different requirements of a

particular application. Also, Ito disclosed a polarization modulator that is driven a train of square pulses 102, that running at half the bit rate (figure 15).

Consider **claim 12**, Ito discloses, a method of APol-PSK transmission comprising: precoding an electronic data signal (read as, an intensity modulator 2, modulating optical signal with NZR data; figure 13); using an electronic data signal to drive a modulator to provide simultaneous polarization alternation and optical data encoding by phase shift keying to generate an APol-PSK signal (figure 13 shows, combination intensity modulator 2, phase modulator 3 and polarization modulator 4, modulate the optical signal; such that, adjacent bits are mutually orthogonal in term of polarization; column 10 lines 10-45). The Examiner takes Official Notice that it is well known in the art to use phase shift keying and differential phase shifting keying as modulation scheme for long distance transmission, since they offer efficient bandwidth usage; thus allowing more data to be transmitted. It would have been obvious for a person of ordinary skill in the art to understand that the phase modulator 3, figure 13, disclosed in Ito can be arranged to perform PSK or DPSK modulation.

Ito fails to disclose, wherein the modulator is a Mach-Zehnder modulator having a polarization rotation device in at least one arm; and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same.

In related art, Miyamoto discloses, an optical transmitting system. The system includes a MZM phase modulator 3; wherein the phase modulator 3 is configured to encode incoming data using phase shift; figures 13 and 14, column 14 line 55 - column 15 line 45).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of

Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22 (the two couplers are polarization independent couplers, meaning they do not separate the optical signal according to their polarization), two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) (Since phase shifters and polarization converters are within the arms of the interferometer; simultaneous polarization alternation and phase shift modulation can be accomplished).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claim 13**, and as applied to **claim 12 above**, claim 13 is rejected for the same reason as claim 6 above.

Consider **claim 14**, and as applied to **claim 12 above**, Ito modified by Miyamoto and Van Der Tol further disclose, demodulating the APol-DPSK signal using an even bit delay line interferometer(Miyamoto disclose, Figure 17 shows a 2 bit delay optical filter 5 is placed at the transmitter end, while Figure 21 shows placing an optical filter 60 at the receiver end; thus it

would have been obvious that the 2 bit delay optical filter 5 shown in figure 17 can also be placed at the receiver end; column 16 lines 40-50, column 17 lines 40-55).

Consider **claim 25**, Ito discloses, an optical transmitter for APoI-PSK transmission comprising: an optical source (light source 1; figure 13); and the combined intensity modulator 2, phase modulator 3 and polarization modulator 4 provide polarization alternation and optical data encoding of an optical signal using phase shift keying. The Examiner takes Official Notice that it is well known in the art, for a phase modulator to be arranged to perform phase shift keying or differential phase shifting keying, for the same reason as indicated in claim 10.

Ito fails to disclose, a Mach-Zehnder (MZ) modulator device optically coupled to the laser source having a polarization rotation device in one arm; and drive circuitry coupled to the MZ modulator device to drive a MZ modulator; and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same.

In related art, Miyamoto discloses, an optical transmitter for APoI-PSK transmission comprising: a Mach-Zehnder (MZ) modulator device optically coupled to the laser source (optical phase modulator 3, MZM type, is connected to light source 4'; figures 13 and 14, column 14 line 55 - column 15 line 45) and

drive circuitry coupled to the MZ modulator device to drive a MZ modulator to provides optical data encoding of an optical signal using phase shift keying (phase modulator 3 is configured to encode incoming data using phase shift and generating DPSK signal; figures 13 and 14, column 14 line 55 - column 15 line 45).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of

Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22 (the two couplers are polarization independent couplers, meaning they do not separate the optical signal according to their polarization), two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) (Since phase shifters and polarization converters are within the arms of the interferometer; simultaneous polarization alternation and phase shift modulation can be accomplished).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claims 19 and 20, and as applied to claim 25 above**, Ito modified by Miyamoto and Van Der Tol disclosed a phase modulator, but fails to disclose a phase modulator is driven by a sinusoidal RF voltage or square pulses.

The examiner take office notice that it is well known in the art at the time of the invention that either sinusoidal RF voltage or square pulse can be use to drive a typical phase modulator. Since, different applications have different requirements, thus, using sinusoidal RF voltage or square pulses to drive a phase modulator provides different fills the different requirements of a

particular application. Also, Ito disclosed a polarization modulator that is driven a train of square pulses 102, that running at half the bit rate (figure 15).

Consider **claim 26**, Ito discloses, an optical transmitter for APoI-DPSK transmission comprising: an optical source (light source 1; figure 13); a precoder (intensity modulator 2; figure 13); and the combined intensity modulator 2, phase modulator 3 and polarization modulator 4 provide polarization alternation and optical data encoding of an optical signal using phase shift keying. The Examiner takes Official Notice that it is well known in the art, for a phase modulator to be arranged to perform phase shift keying or differential phase shifting keying, for the same reason as indicated in claim 10.

Ito fails to disclose, a Mach-Zehnder (MZ) modulator device optically coupled to the laser source having a half wave plate in one arm; and drive circuitry coupled to the MZ modulator device to drive a MZ modulator; and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same.

In related art, Miyamoto discloses, an optical transmitter for APoI-PSK transmission comprising: a Mach-Zehnder (MZ) modulator device optically coupled to the laser source (optical phase modulator 3, MZM type, is connected to light source 4'; figures 13 and 14, column 14 line 55 - column 15 line 45) and

drive circuitry coupled to the MZ modulator device to drive a MZ modulator to provides optical data encoding of an optical signal using phase shift keying (phase modulator 3 is configured to encode incoming data using phase shift and generating DPSK signal; figures 13 and 14, column 14 line 55 - column 15 line 45).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of

Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator having a half-wave plate in one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22 (the two couplers are polarization independent couplers, meaning they do not separate the optical signal according to their polarization), two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) (Since phase shifters and polarization converters are within the arms of the interferometer; simultaneous polarization alternation and phase shift modulation can be accomplished). The Examiner takes official notice that it is well known in the art that a half-wave plate is use for polarization rotation of 90 degrees. Since Van Der Tol discloses a polarization converter for converting TE to TM polarization and vice versa. Then it would have been obvious for a person of ordinary skill in the art to know that the polarization converter can be a half-wave plate. Since using a half-wave plate for polarization rotation is simple and requires little components; thus, reducing the cost of the system.

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Miyamoto as modified by Ito. Since Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

Consider **claim 28**, Ito discloses, an optical transmitter for APoI-DPSK transmission comprising: an optical source (light source 1; figure 13); and the combined intensity modulator 2, phase modulator 3 and polarization modulator 4 provide polarization alternation and optical data encoding of an optical signal using phase shift keying. The Examiner takes Official Notice that it is well known in the art, for a phase modulator to be arranged to perform phase shift keying or differential phase shifting keying, for the same reason as indicated in claim 10.

Ito fails to disclose, a modulator means having a polarization rotation device.

In related art, Miyamoto discloses, an optical transmitter for APoI-PSK transmission comprising: a Mach-Zehnder (MZ) modulator device optically coupled to the laser source (optical phase modulator 3, MZM type, is connected to light source 4'; figures 13 and 14, column 14 line 55 - column 15 line 45).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to replace the intensity and phase modulator of Ito with the MZM phase modulator of Miyamoto. Since replacing a modulator only requires basic knowledge for a person of ordinary skill in the art (i.e. replacing an intensity modulator with a phase modulator).

In related art, Van Der Tol discloses, a Mach-Zehnder modulator including a polarization rotation device in at least one arm and wherein input signals to both arms of the Mach-Zehnder modulator have polarization that are the same (figure 3 shows an interferometer comprising two 50/50 coupler 21 and 22, two polarization converter 27 and 29 (i.e. polarization rotator), and four phase shifters 25, 26 and 30, 31; column 5 lines 1-50) .

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Van Der Tol with Ito modified by Miyamoto. Since

Van Der Tol shows the method and apparatus for integrating phase modulation and polarization alternation together in a single interferometer; thus reducing the steps necessary for generating phase modulating and polarization alternation.

7. **Claims 21, 22, 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ito** (US Patent # 6,650,846) in view of **Miyamoto et al.** (US Patent # 7,116,917) and further in view of **Van Der Tol** (US Patent # 5,708,734) and further in view of **Yao** (US Patent# 5,654,818).

Consider **claim 21**, and as applied to **claim 25 above**, Ito modified by Miyamoto and Van Der Tol disclosed wherein the Mach-Zehnder modulator comprises two complementary output ports (Van Der Tol shows in figure 3, each arm of the interferometer provides a different output; column 5 lines 1-55), but fails to disclose wherein the apparatus transmitter further comprises a polarization beam combiner for combining outputs from the two output ports of the Mach-Zehnder modulator.

In related art, Yao discloses an interferometer which includes a polarization beam combiner 12' for combining the outputs from each arm of the interferometer (figure 3; column 6 lines 1-18).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Yao with Ito modified by Miyamoto and Van Der Tol. Since a polarization beam combiner's function is equivalent to a polarization independent beam combiner; thus they can be use interchangeably.

Consider **claims 22 and 23, and as applied to claim 21 above**, Ito modified by Miyamoto, Van Der Tol and Yao disclosed a phase modulator, but fails to disclose a phase modulator is driven by a sinusoidal RF voltage or square pulses.

The examiner take office notice that it is well known in the art at the time of the invention that either sinusoidal RF voltage or square pulse can be use to drive a typical phase modulator. Since, different applications have different requirements, thus, using sinusoidal RF voltage or square pulses to drive a phase modulator provides different fills the different requirements of a particular application. Also, Ito disclosed a polarization modulator that is driven a train of square pulses 102, that running at half the bit rate (figure 15).

8. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Ito (US Patent # 6,650,846)** in view of **Miyamoto et al. (US Patent # 7,116,917)** and further in view of **Fujiwara et al. (US PGPub 2003/0161638)**.

Consider **claim 4**, and as applied to **claim 10 above**, Ito modified by Miyamoto disclosed the invention as described above, except for, wherein the optical signal is launched into the modulator having a polarization oriented at a predetermined angle such that the polarization of successive optical bits of the output signal are substantially orthogonal.

In related art, Fujiwara discloses, wherein the optical signal is launched into the modulator (polarization scrambler; figure 22A) having a polarization oriented at a predetermined angle (the polarization entering the polarization scrambler is oriented at 45 degrees) such that the polarization of successive optical bits of the output signal are substantially orthogonal (figure 22A; paragraphs 0194, 0198).

It would have been obvious for a person of ordinary skill in the art at the time of the invention to incorporate the teachings of Fujiwara with Ito modified by Miyamoto. Since, Fujiwara et al. disclose a device with can perform polarization alternation of optical signal with less components; thus, reducing the overall cost of the transmission system.

#### *Response to Arguments*

9. Applicant's arguments with respect to claims 2-10, 12-14, 19-23, 25-26, 28-29 have been considered but are moot in view of the new ground(s) of rejection.

#### *Conclusion*

10. Any response to this Office Action should be **faxed to (571) 273-8300 or mailed to:**

Commissioner for Patents  
P.O. Box 1450

Alexandria, VA 22313-1450

**Hand-delivered responses** should be brought to

Customer Service Window  
Randolph Building  
401 Dulany Street  
Alexandria, VA 22314

11. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Thi Le whose telephone number is (571) 270-1104. The Examiner can normally be reached on Monday-Friday from 7:30am to 5:00pm.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kenneth Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or 703-305-3028.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist/customer service whose telephone number is (571) 272-2600.

*Thi Le*



KENNETH VANDERPUYE  
SUPERVISORY PATENT EXAMINER